

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-119421

(43)Date of publication of application : 23.04.2003

(51)Int.Cl.

C09D163/00  
C04B 41/61  
C09D129/12  
C09D177/00

(21)Application number : 2001-316551

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(22)Date of filing : 15.10.2001

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(54) COATING MATERIAL FOR REINFORCING CONCRETE, AND CONCRETE STRUCTURE REINFORCED THEREBY

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a pasty coating material for reinforcing concrete, easily applied to a concrete structure by breaking down a conventional concept concerning the coating material for the concrete, and thereby enabling the strength of the concrete structure to be extremely increased, and further to provide the concrete structure reinforced with the coating material.

SOLUTION: The pasty coating material for reinforcing the concrete contains (A) an epoxy resin, (B) a first fiber comprising a ceramic fiber, (C) a second fiber selected from the group consisting of a carbon fiber, an aramid (aromatic polyamide) fiber, a polyketone fiber and a glass fiber, and (D) a pigment. The concrete structure is reinforced with the coating material.

## LEGAL STATUS

[Date of request for examination]

01.05.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the coating for paste-like concrete reinforcement, and the concrete structure reinforced by that cause.

[0002]

[Description of the Prior Art] The concrete paint which paints concrete from the former to concrete for [ for waterproofing ] carbonation prevention for makeup is known well. Even if it applied this kind of concrete paint twice or performed coating 3 times, that thickness was about at most 0.15mm thing. Although it also has the reasons of coating efficiency, the main causes originate in the purpose of the above-mentioned concrete paint.

[0003] Although there was a method of pasting up a carbon fiber sheet and a glass fiber sheet on the concrete structure in order to have reinforced the concrete structure conventionally, in needing many helps, the remarkable time necessary for completion was needed.

[0004]

[Problem(s) to be Solved by the Invention] The purpose of this invention can explode the concept about the conventional concrete paint, can apply it to the concrete structure easily, and is in the point of offering the new coating for paste-like concrete reinforcement and the concrete structure reinforced by that cause which can bring the remarkable improvement in on the strength by this to the concrete structure.

[0005]

[Means for Solving the Problem] The 1st of this invention is related with the coating for paste-like concrete reinforcement characterized by containing the 2nd fiber and the (D) pigment which were chosen from the group which consists of the 1st fiber and the (C) carbon fiber which consist of a (A) epoxy resin and (B) ceramic fiber, aramid (aromatic polyamide) fiber, poly ketone fiber, and a glass fiber. The 2nd of this invention is related with the coating for paste-like concrete reinforcement according to claim 1 10,000cps - 35,000cps of 15,000cps - 30,000cps of whose viscosity of said coating for concrete reinforcement is 20,000cps - 25,000cps especially preferably preferably. In the coating for paste-like concrete reinforcement with which the 3rd of this invention contains the 1st fiber, carbon fiber (C-1), and the (D) pigment which consist of a (A) epoxy resin and (B) ceramic fiber It is based on the weight of an epoxy resin (A). Ceramic fiber (B) 3-5 % of the weight, It is preferably related with a pigment (D) initial complement and the coating for paste-like concrete reinforcement according to claim 1 or 2 which contains 1 - 2 % of the weight preferably 3.5 to 4.5% of the weight 3.5 to 4.5% of the weight 3 - 5 % of the weight (C-1) of carbon fibers. In the coating for paste-like concrete reinforcement with which the 4th of this invention contains the 1st fiber, the aramid fiber (C-2) or (C-3) the poly ketone fiber, and the (D) pigment which consist of a (A) epoxy resin and (B) ceramic fiber It is based on the weight of an epoxy resin (A). Ceramic fiber (B) 1.5-3 % of the weight, It is preferably related with a pigment (D) initial complement and the coating for paste-like concrete reinforcement according to claim 1 or 2 which contains 1 - 2 % of the weight preferably four to 6% of the weight 3.5 to 4.5% of the weight an aramid fiber (C-2) or 5 - 7 % of the weight (C-3) of poly ketone fiber. In the coating for paste-like concrete reinforcement with which the 5th of this invention contains the 1st fiber, glass fiber (C-4), and the (D) pigment which consist of a (A) epoxy resin and (B) ceramic fiber It is based on the weight of an epoxy resin (A). Ceramic fiber (B) 1.5-3 % of the weight, It is preferably related with a pigment (D) initial complement and the coating for paste-like concrete reinforcement according to claim 1 or 2 which contains 1 - 2 % of the weight preferably six to 9% of the weight 3.5 to 4.5% of the weight 7 - 10 % of the weight (C-4) of glass fibers. the 6th of this invention -- the front face -- a claim -- it is related with the concrete structure characterized by forming the coating for paste-like concrete reinforcement of a publication by 0.8-1.5mm thickness (thickness when drying) one to 5 either.

[0006] The die length of the 1st fiber and 2nd fiber which are used by this invention is 1-4mm especially preferably 1-6mm preferably 0.5-10mm. Since the paintwork of a coating will get worse if a role required as reinforcement fiber

cannot be enough attained if shorter than 0.5mm, but it becomes longer than 10mm, it is not desirable. The optimal die length of fiber changes according to the quality of the material of each fiber. In the case of the carbon fiber which is the 2nd fiber, it is 3-5mm preferably die length of 1-6mm, and in the case of the ceramic fiber which is the 1st fiber, it is 3-6mm preferably die length of 5-10mm, and, in the case of a glass fiber, is [ in the case of an aramid fiber or poly ketone fiber, it is 3-5mm preferably die length of 1-6mm, and ] 1-3mm preferably die length of 0.5-5mm.

[0007] The size of each fiber changes a proper size according to the quality of the material of fiber. In the case of the carbon fiber which is the 2nd fiber, it is 5-10 micrometers preferably the diameter of 3-15 micrometers, and in the case of the ceramic fiber which is the 1st fiber, it is 200-300 micrometers preferably the diameter of 150-600 micrometers, and, in the case of a glass fiber, is [ in the case of an aramid fiber or poly ketone fiber, it is 7-15 micrometers preferably the diameter of 5-20 micrometers, and ] 7-9 micrometers preferably the diameter of 6-10 micrometers.

[0008] As ceramic fiber used for this invention, there are an alumina fiber, a boron fiber, silicon carbide fiber, etc.

[0009] As a carbon fiber used for this invention, although there are various types, such as a high intensity type, an ultrahigh strength type, and a rate type of high elasticity, if needed, it is independent, or can be used together and used.

[0010] As an aramid fiber used for this invention, although there are a high elasticity type, a super-high elasticity type, etc., if needed, it is independent, or can be used together and used. Moreover, poly ketone fiber is the thing of the molecular structure which incorporated the carbon monoxide into the molecular structure of ethylene, and, according to the data of Asahi Chemical Co., Ltd., is fiber very near an aramid fiber in respect of reinforcement, ductility, an elastic modulus, the rate of a heat shrink, and specific gravity.

[0011] As for the glass fiber and ceramic fiber which are used for this invention, it is desirable to perform coupling processing in order to raise compatibility with a resinous principle.

[0012] As an epoxy resin used for this invention, what is used as an epoxy coating of ordinary temperature dry sand mould is desirable. Curing agents, such as an amine or amine adduct, polyamides (for example, triethylenetetramine / dimer acid denaturation polyamide), and isocyanate, can also be blended with these epoxy coating. In this invention, it can also be used as a non-solvent mold using a liquefied epoxy resin. As an epoxy resin in this invention, the bisphenol A mold epoxy resin, a bisphenol E mold epoxy resin, a bisphenol female mold epoxy resin, etc. can be mentioned.

[0013] Moreover, in this invention, the various additives usually blended with the concrete coating can also be blended.

[0014]

[Example] Although an example is given to below and this invention is explained to it, thereby, this invention is not limited at all.

[0015] 1kg (bisphenol female-mold liquefied epoxy resin: Japan epoxy resin, Inc. trade name Epicoat 801) of example 1 epoxy resins, 40g (die length of 2mm of fiber) of ceramic fiber, 30g (the die length of fiber 3mm) of carbon fibers, and 10g of pigments are kneaded enough. Denaturation alicyclic polyamine (trade name DAITO Larc HD-438) 250g was mixed as a curing agent before use, and it painted by the coverage of 1.0kg/m<sup>2</sup> on the concrete slab front face with a thickness of 60mm.

[0016] It measured before applying the flexural strength and compressive strength of a concrete slab, respectively about three persons after coating spreading hardening of an example 1, and commercial coating spreading hardening. The result is shown in the following table 1.

[Table 1]

	塗布前	実施例1	市販塗料 * 1
曲げ強度	50kgf/cm <sup>2</sup>	140kgf/cm <sup>2</sup>	80kgf/cm <sup>2</sup>
圧縮強度	240kgf/cm <sup>2</sup>	530kgf/cm <sup>2</sup>	250kgf/cm <sup>2</sup>

\* 1 : 0.5kgf/m<sup>2</sup>量しか塗布できなかった。

塗布後のデータは塗布後7日間経過後に測定したものである。

The passage clear from Table 1, by applying the coating of this invention, compared with what does not paint a concrete slab, about 3 times were seen with flexural strength, and the twice [ about ] as many improvement effect as this was seen with compressive strength.

[0017] Instead of 30g of carbon fibers of example 2 example 1, the example 1 was repeated except having used 50g of aramid fibers. Like the example 1, compared with what does not paint a concrete slab, about 3 times were seen with flexural strength, and the twice [ about ] as many improvement effect as this was seen by the result with compressive strength.

[0018] The example 1 was repeated except having used 80g of glass fibers instead of 30g of carbon fibers of example 3 example 1. Like the example 1, compared with what does not paint a concrete slab, about 3 times were seen with flexural strength, and the twice [ about ] as many improvement effect as this was seen by the result with compressive

strength.

[0019]

[Effect of the Invention] Without producing sagging, the coating for concrete reinforcement of this invention could form quickly the thick paint film of 0.8-1.5mm in concrete, and, thereby, was able to shorten the time necessary for completion remarkably compared with old concrete reinforcement work. Moreover, reinforcement not only improved, but the concrete structure reinforced by this is excellent in weatherability, chemical resistance, and makeup nature.

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**CLAIMS**

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[Claim(s)]

[Claim 1] (A) The coating for paste-like concrete reinforcement characterized by containing the 2nd fiber and the (D) pigment which were chosen from the group which consists of the 1st fiber and the (C) carbon fiber which consist of an epoxy resin and (B) ceramic fiber, aramid (aromatic polyamide) fiber, poly ketone fiber, and a glass fiber.

[Claim 2] The coating for paste-like concrete reinforcement according to claim 1 whose viscosity of said coating for concrete reinforcement is 10,000cps - 35,000cps.

[Claim 3] (A) The coating for paste-like concrete reinforcement according to claim 1 or 2 which contains 3 - 5 % of the weight (C-1) of carbon fibers ceramic fiber (B) 3-5% of the weight on the basis of the weight of an epoxy resin (A) in the coating for paste-like concrete reinforcement containing the 1st fiber, carbon fiber (C-1), and the (D) pigment which consist of an epoxy resin and (B) ceramic fiber.

[Claim 4] (A) In the coating for paste-like concrete reinforcement containing the 1st fiber, the aramid fiber (C-2) or (C-3) the poly ketone fiber, and the (D) pigment which consist of an epoxy resin and (B) ceramic fiber The coating for paste-like concrete reinforcement according to claim 1 or 2 which contains an aramid fiber (C-2) or 5 - 7 % of the weight (C-3) of poly ketone fiber ceramic fiber (B) 1.5-3% of the weight on the basis of the weight of an epoxy resin (A).

[Claim 5] (A) The coating for paste-like concrete reinforcement according to claim 1 or 2 which contains 7 - 10 % of the weight (C-4) of glass fibers ceramic fiber (B) 1.5-3% of the weight on the basis of the weight of an epoxy resin (A) in the coating for paste-like concrete reinforcement containing the 1st fiber, glass fiber (C-4), and the (D) pigment which consist of an epoxy resin and (B) ceramic fiber.

[Claim 6] the front face -- a claim -- the concrete structure characterized by forming the coating for paste-like concrete reinforcement of a publication by 0.8-1.5mm thickness (thickness when drying) one to 5 either.

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[Translation done.]